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CODING OF MOVING PICTURES AND ASSOCIATED AUDIO

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Summary

This week in New York, at a meeting hosted by Columbia University, the Moving Picture Experts Group (MPEG) completed definition of MPEG-2 Video, MPEG-2 Audio, and MPEG-2 Systems. MPEG therefore confirmed that it is on schedule to produce, by November 1993, Committee Drafts of all three parts of the MPEG-2 Standard, for balloting by its member countries.

To ensure that a harmonized solution to the widest range of applications is achieved, MPEG, an ISO/IEC working group designated ISO/IEC JTC1/SC29/WG11, is working jointly with the ITU-TS Study Group 15 "Experts Group for ATM Video Coding." MPEG also collaborates with representatives from other parts of ITU-TS, and from EBU, ITU-RS, SMPTE, and the North American HDTV community.

MPEG-2 Video

MPEG is developing the MPEG-2 Video Standard, which specifies the coded bit stream for high-quality digital video. As a compatible extension, MPEG-2 Video builds on the completed MPEG-1 Video Standard (ISO/IEC IS 11172-2), by supporting interlaced video formats and a number of other advanced features, including features to support HDTV.

As a generic International Standard, MPEG-2 Video is being defined in terms of extensible profiles, each of which will support the features needed by an important class of applications. At the March MPEG meeting in Sydney, the MPEG-2 Main Profile was defined to support digital video transmission in the range of about 2 to 15 Mbits/sec over cable, satellite, and other broadcast channels, as well as for Digital Storage Media (DSM) and other communications applications.Building on this success at this week's New York meeting, MPEG experts from participating countries in Asia, Australia, Europe, and North America further defined parameters of the Main Profile and Simple Profile suitable for supporting HDTV formats.

This week the MPEG experts also extended the features of the Main Profile by defining a hierarchical/scalable profile. This profile aims to support applications such as compatible terrestrial TV/HDTV, packet-network video systems, backward-compatibility with existing standards (MPEG-1 and H.261), and other applications for which multi-level coding is required. For example, such a system could give the consumer the option of using either a small portable receiver to decode standard definition TV, or a larger fixed receiver to decode HDTV from the same broadcast signal.

This week's accomplishments in New York mean that the technical definition of MPEG-2 Video has been completed. This was a critical milestone, and shows that MPEG-2 Video is on schedule for a Committee Draft in November.

MPEG-2 Audio

MPEG is developing the MPEG-2 Audio Standard for low bitrate coding of multichannel audio. MPEG-2 Audio coding will supply up to five full bandwidth channels (left, right, center, and two surround channels), plus an additional low frequency enhancement channel, and/or up to seven commentary/multilingual channels. The MPEG-2 Audio Standard will also extend the stereo and mono coding of the MPEG-1 Audio Standard (ISO/IEC IS 11172-3) to half sampling-rates (16 kHz, 22.05 kHz, and 24 kHz), for improved quality for bitrates at or below 64 kbits/s, per channel.

This week in New York, MPEG produced an updated version of the MPEG-2 Audio Working Draft, and is on track for achieving a Committee Draft specification by the November MPEG meeting.

The MPEG-2 Audio multichannel coding Standard will provide backward-compatibility with the existing MPEG-1 Audio Standard (ISO/IEC IS 11172-3). Together with ITU-RS, MPEG is organizing formal subjective testing of the proposed MPEG-2 multichannel audio codecs and up to three non-backward-compatible (NBC) codecs. The NBC codecs are included in order to determine whether an NBC mode should be introduced as an addendum to the standard. If the results show clear evidence that an NBC mode improves the performance, a formal call for NBC proposals will be issued by MPEG, with a view to incorporate these features in the audio syntax.

MPEG-2 Systems

MPEG is developing the MPEG-2 Systems Standard to specify coding formats for multiplexing audio, video, and other data into a form suitable for transmission or storage. There are two data stream formats defined: the Transport Stream, which can carry multiple programs simultaneously, and which is optimized for use in applications where data loss may be likely, and the Program stream, which is optimized for multimedia applications, for performing systems processing in software, and for MPEG-1 compatibility.

Both streams are designed to support a large number of known and anticipated applications, and they retain a significant amount of flexibility such as may be required for such applications, while providing interoperability between different device implementations. The Transport Stream is well suited for transmission of digital television and video telephony over fiber, satellite, cable, ISDN, ATM, and other networks, and also for storage on digital video tape and other devices. It is expected to find widespread use for such applications in the very near future.

The Program Stream is similar to the MPEG-1 Systems standard (ISO/IEC 11172-1). It includes extensions to support new and future applications. Both the Transport Stream and Program Stream are built on a common Packetized Elementary Stream packet structure, facilitating common video and audio decoder implementations and stream type conversions. This is well-suited for use over a wide variety of networks with ATM/AAL and alternative transports.

This week in New York, MPEG completed definitions of the features, syntax, and semantics of the Transport and Program Streams, enabling product designers to proceed. Among other items, the Transport Stream packet length was fixed at 188 bytes, including the 4-byte header. This length is suited for use with ATM networks, as well as a wide variety of other transmission and storage systems.

MPEG-4

Work on a new MPEG initiative for very low bitrate coding of audiovisual programs has been approved by unanimous ballot of all national bodies of ISO/IEC JTC1. This work will begin officially at the next MPEG meeting in Brussels in September 1993. It isscheduled to result in a draft specification in 1997.

This work will require the development of fundamentally new algorithmic techniques. In conjunction with the MPEG meeting this week in New York, a one-day seminar was held on current research ideas applicable to low bitrate coding. Demonstrations and papers were presented on a number of techniques, including model-based image coding, human interaction with multimedia environments, and low-bitrate speech coding.

When completed, the MPEG-4 standard will enable a whole spectrum of new applications, including interactive mobile multimedia communications.